result in the production of distinct mental symptoms and in the partial excretion of the substances into the gastrointestinal tract. The disturbance induced by such substances is capable of producing nausea and vomiting.

45 (137). **"The formation of urea": L. B. STOOKEY** and **A. S. GRANGER.** (Presented by **R. A. HATCHER.**)

Subcutaneous injection of liver-extracts (dog) was found to lead, in the dog, to an increased elaboration of nitrogenous end-products into urea. Liver extracts which had been heated to 55° C. failed to manifest this stimulative action. These results might indicate an enzymatic formation of urea. Further experiments are in progress.

46 (138). **"The effects on embryonic development of the Röntgen rays acting on the spermatozoa of the toad previous to fertilization": C. R. BARDEEN.** (Presented by **EUGENE L. OPIE.**)

Experiments have shown that spermatogenesis may be inhibited by exposure to the Röntgen rays or to radium. The direct action of the rays on the spermatozoa has not, apparently, been studied. It occurred to the author that it would be interesting to see if spermatozoa could be injured by the Röntgen rays and, if so, what the effect would be on the development of ova fertilized by spermatozoa thus affected. During the short breeding season of the toads in the vicinity of Madison, Wisconsin, the author collected daily several pairs of toads, separated the males from the females, and from the males got enough sperm to make a slightly cloudy suspension in water. This suspension was divided into two parts, one of which was kept for control purposes, while the other was exposed for from an hour and a half to two hours and a half to Röntgen rays. Several of the females were then opened, until, when possible, one was found in which the eggs seemed abundant and ready to be discharged. Two short strings of eggs were removed and each string was divided into two parts; one part was placed in the control dish, the other in that which had been exposed to the rays. After about fifteen minutes each string was placed in a separate dish of water.

Several of the experiments proved of negative value either be-

cause not even the spermatozoa of the control dish proved capable of fertilizing the eggs, owing to the time which had elapsed since the removal of the sperm from the male, or because none of the females happened to have ova in the right condition to be fertilized. The thoroughly successful experiments, owing to the short season of mating, were few in number but they were convincingly positive. All eggs fertilized by the control spermatozoa developed normally. Only one egg in fifty to a hundred that were fertilized by the exposed spermatozoa, developed at all normally. All the others showed marked defects in development.

The results of the experiments may be briefly summarized as follows:

1. The spermatozoa of the common toad retain power of movement and fertilization for from one-half to nearly three hours in a dish of lake water at room temperature. On hot days they die sooner than on cool days.

2. Spermatozoa when under exposure of Röntgen rays die sooner than when not thus exposed.

3. When spermatozoa are exposed to the rays so long that very few are capable of fertilizing ova, the eggs thus fertilized usually do not develop into larvas but they may do so.

4. When spermatozoa have been exposed for a considerable period to the Röntgen rays and yet are still capable of fertilizing a considerable proportion of eggs placed in the same dish the eggs seem to develop normally at first, but beyond the gastrula stage the development becomes retarded and the resulting larvas are markedly deformed. These deformities are quite varied. In one larva for instance, a considerable part of the central nervous system and the gills were undeveloped on one side while the abdominal viscera were developed only on that side. In another the central nervous system was abnormal on both sides and the alimentary canal quite defective. Considerable further study is necessary to determine accurately the nature of all the abnormalities present in the various monsters the author has preserved. Apparently all are defect abnormalities.

From the results obtained it may be concluded:

1. That nuclear material may be so influenced by exposure to the Röntgen rays that after a latent period it will call forth marked abnormalities in development.

2. That injury to spermatozoa capable of fertilizing ova may cause the development of monsters from the ova thus fertilized.

47 (139). "**A vago-esophageal reflex**": **S. J. MELTZER** and **JOHN AUER.**

The general knowledge of the contractions of the esophagus is confined to the peristaltic movements, that is, the consecutive contractions of the successive parts of the esophagus following a normal deglutition, or, as it was described by Meltzer at a previous meeting of this society, after an injection of liquid or insufflation of air directly into the esophagus. A simultaneous contraction of the entire esophagus can be produced only by stimulating the peripheral end of the vagus when cut in the neck.

The authors discovered that in dogs a tetanic contraction of the entire esophagus can be caused also by reflex ways. When the vagus is cut in any part of the neck, an electric stimulation of its central end causes a prompt longitudinal and circular contraction of the entire esophagus, which lasts as long as the stimulation continues. Particulars and other interesting facts connected with this observation will be reported later.

48 (140). "**Ion protein compounds,**" with exhibition of products: **WILLIAM J. GIES.**

About five years ago the author found that "when the electric current is passed through neutral or alkaline mucoid solutions (consisting of sodium or calcium salts of mucoids) turbidity results within a short time, and flocks eventually form and can be filtered off." This observation was included in a preliminary report of work then in progress.[1] About the same time Huiskamp had been making similar observations in connection with salts of nucleoprotein from thymus.[2] Shortly afterward, in preparing material for work in another connection,[3] the author precipitated from an alkaline solution (Na_2CO_3) of mucoid, with the aid of acetone

[1] Mead and Gies: *American Journal of Physiology*, 1902, vi (*Proc. Amer. Physiol. Soc.*, 1901, p. xxviii); also Gies and collaborators: Biochemical Researches, 1903, i, p. 53.

[2] Huiskamp: *Zeitschrift für physiologische Chemie*, 1901–'02, xxxiv, p. 32.

[3] Gies: *Loc. cit.*, 1903, viii (*Proc. Amer. Physiol. Soc.*, 1902, p. xliii); Biochemical Researches, p. 54.